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ABSTRACT

Reviewed is research regarding procedures to enhance the maintenance and generalization of induced behavior changes. Discussion of the procedures is divided into three categories: transfer of training (including treatment under many different stimulus conditions), changing the natural environment (through training parents, peers, and others in daily contact with the child), and teaching the client self regulating procedures (such as self-recording of behavior). It is concluded that teaching the client self regulating behaviors offers the key to maintenance or generalization of behavior across time and environments. (Author/CL)

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PROCEDURES THAT ENHANCE THE MAINTENANCE AND GENERALIZATION OF INDUCED BEHAVIORAL CHANGE

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PROCEDURES THAT ENHANCE THE MAINTENANCE AND GENERALIZATION OF INDUCED BEHAVIORAL CHANGE

W. Weston Williams

Abstract

Procedures which clinicians may utilize to enhance the maintenance and generalization of induced behavioral changes are reviewed and described. The procedures are divided into three categories: transfer training, changing the natural environment, and teaching the client self-regulating behaviors. It is concluded that teaching the client self-regulating behaviors offers the key to maintenance or generalization of behavior across time and environments.

Abnormal behavior is commonly defined within the learning paradigm as behavior which 's not under the same stimulus control as normal behavior; i.e., the labeler's behavior. (Ullmand and Krasner, 1969; and Kanfer and Phillips, 1970)

The behavioral therapist's job is to bring abnormal behavior under appropriate stimulus control and to insure the generalization and maintenance of the stimulus control in the natural environment. The ultimate success of a therapy program lies in the degree to which it accomplishes maintenance and generalization of behavioral change: the focus of this paper is the often neglected topic of techniques that facilitate this process.

Maintenance of a behavioral change is defined as the post-treatment continuance of a particular response strength level of a modified behavior. A study by O'Brien, Bugle and Azrin (1972) indicates that maintenance of a behavior change must be programmed for and monitored. A retarded child was trained by a manual guidance procedure to eat with a spoon; but after reaching criterion level the behavior was decelerated. Further study revealed that although the behavior was well learned it was maintained only when a motivating maintenance program was in effect.

Sidman (1960) discusses the phenomena of stimulus generalization and response induction. Most research in this area has taken place in the animal laboratories. A typical experiment (Guttman & Kalish, 1956) demonstrating stimulus generalization might include a pigeon and a stimulus box equipped with an illuminated key. After the pigeon has learned to earn grain by pecking the key, the grain reinforcement is programmed on a variable intervel schedule to achieve a relatively high pecking rate. During phases when the responses are reinforced, the key illumination is maintained at a constant wave length of 550 millimicrons.

Next, the feeder is disconnected and the experiment is carried out under an extinction condition. (This procedure is called "probing for generalization.") In this phase, the color of the key is systematically varied over a broad spectral range. The result is that the greatest number of extinction responses occur at 550 millimicrons; and as key wave lengths differ more and more from 550 millimicrons, the number of responses diminishes. The curve representing this phenomenon is called a "generalization gradient." The gradient reflects a subject's tendency to respond not only to stimuli that were present during reinforcement but also to stimuli never associated with reinforcement.

Sidman states that, "The generalization gradient provides a mechanism whereby behavior can adapt to an environment that never exactly repeats any combination of 'stimuli.' If a successful form of behavior were to come under the control only of the precise circumstances that were present at the time it was acquired, we should have to relearn the behavior each time the original situation recurred with its inevitable variations." (p. 207)

Response induction may be considered the response counterpart of stimulus generalization. A typical experiment (Hull, 1943) on induction gradients might include a rate and a stimulus box equipped with a key. The rat is reinforced with food pellets only when it presses the lever with greater than 21 grams of pressure. Over 100 trials considerable variability in the pressure (12 to 45 grams) is observed. Such variability is represented on a response induction gradient. Response variation has adaptive value because dimensions of the environment vary and behavior must vary accordingly. The reinforcement of one response apparently reinforces topographically similar responses.

Recent studies with human subjects demonstrate that generalization is enhanced by similarity of environmental configurations and can occur across topographically similar behaviors (Petersen and Whitehurst, 1971; Sajwaj and Risely, 1970; and Garcia, Baer and Firestone, 1971). For instance, Sajwaj and Risely (1970) investigated the development of generalization of laboratory taught writing skills in a retarded girl. It was found that improvement of writing skills occurred concomitantly at home and that increasing the similarity between the home and the laboratory furthered generalization. Garcia, et. al. (1971) investigated the development of imitation within specified topographical boundaries. Three types of imitative responses (small motor, large motor, and short vocal) were taught within a multiple baseline procedure in which they were successively brought under control. Imitative generalization was measured throughout the study by proving for the occurrence of nonreinforced imitative responses. Generalization was found to be topographically confined to the type of imitation previously trained.

According to Bandura (1969) three procedures facilitate the maintenance and generalization of behavior: transfer training; alteration of the reinforcement practices of the social environments; and establishment of self-regulatory function.

Transfer Training:

If therapy is performed outside the client's natural environment and/or uses reinforcement contingencies not found in it, the therapist must take measures to insure the transfer of behavior change to that environment. Three general procedures are commonly employed to facilitate transfer of training: (1) bringing target behaviors under control of SD's and reinforcers which control them in the natural environment; (2) performing treatment in many situations; and (3) probing and following up behavioral change to test for generalization and post-treatment maintenance. The first procedure usually involves bringing the target behavior up to desired strength through continuous reinforcement. Once the behavior is firmly established, reinforcement is made contingent upon increasingly variable ratios and intervals of correct responses until the frequency and quantity of reinforcement is comparable to that which controls the behavior in the natural environment. Phillips, Phillips, Fixen and Wolf (1971) used this procedure to accelerate predelinquent boys' room-cleaning behaviors. On a daily basis the boys

earned or lost points contingent upon room cleaning and were given feedback on items that did not meet the definition of room cleaning. This procedure accelerated room-cleaning behaviors. In the final phase of the study, points were given for 13 days, without feedback, and then faded out. The fading procedure involved reducing the percentage of days the contingency occurred as well as thinning the reinforcement schedule itself; consequences were reduced from 100% to 50% for eight days, then 33% for nine days, 16% for 27 days, and finally 8% for 25 days. Throughout the point-fading phase, room cleaning behavior was maintained at a high and stable level.

In some cases a client is unable to obtain rewards for appropriate behavior because his behavior repertoire lacks the potentially rewardable behaviors. In this situation the therapist usually models, chains, or shapes these behaviors to criterion. If the available rewards in the natural environment function as reinforcers for the client, then artificial contingencies can be withdrawn relatively abruptly while desired behavior change maintains and generalizes.

For example, some children fail to interact socially, not because the situation is not potentially reinforcing to them, but because they lack requisite skills and have seldom if ever experienced the rewards involved. Several studies (Allen, Hart, Buell, Haris and Wolf, 1964; Milby, 1970; Kirby and Toler, 1970; Whitman, Mercurid and Caponigra, 1970; and Baer and Wolf, 1967) suggest that if a social isolate's social contact behavior is artificially shaped, the reinforcing properties of the social interactions will often maintain and generalize the behavior when the artificial contingencies are abruptly withdrawn. For instance, Whitman, et. al., (1970) reinforced an isolated child for passing balls and blocks to other children. When the artificial contingency was withdrawn the social interactions maintained and generalized (although at a somewhat lower level), presumably as a consequence of the reinforcement properties of the social interactions.

If the reinforcement contingencies that normally facilitate the maintenance and generalization of desirable behaviors in the natural environment do not function as reinforcers for the client, then the therapist usually initially modifies the client's behavior through the use of immediate primary reinforcers. The technique commonly employed (Valett, 1966; Thomas, Becker and Armstrong, 1968; and O'Leary and Becker, 1970) is the pairing of social stimuli (e.g., "good boy," smiles, pat on head) with a primary reinforcer. The primary reinforcement is faded out as the social stimuli become reinforcing through pairing. When desired behaviors are being maintained by immediate social reinforcement alone, the social reinforcement schedule is thinned until it approaches a schedule the therapist judges can be maintained in the natural environment.

For example, O'Leary and Becker (1970) employed tokens (backed up by a reinforcement menu) paired with social stimuli to reinforce nine-year-old children for operationally defined "on-task" school behaviors.

The time period between the appropriate behavior and the reward, and the number of appropriate behaviors required to earn a reward were continually increased to implement a transfer of control from the token reinforcers to the more traditional reinforcement contingencies of intermittent teacher praise and attention.

As Valett (1966) and Thomas, et. al. (1968) have indicated, extrinsic rewards may be employed temporarily to teach clients a new behavior, but the behavior itself (through association with reinforcers) may become sufficiently reinforcing to sustain further development of the behavioral skill. Also, many forms of behavior may persist with little external support because they are functional in producing rewarding outcomes. Thus, induced changes in such behaviors as social interactions, reading, math, and communicative skills may maintain and generalize with little artificial external support.

Another procedure which facilitates transfer of learning is conducting treatment in many different situations (Browning and Stover, 1971; Horner, 1971; and Redd, 1970). This procedure precludes situation-specific learning when more widespread performance of a behavior is desirable. If the client has been reinforced for the appropriate behavior in varied stimulus configurations, many SD's and reinforcing events will control behavior, facilitating generalization and maintenance. For example, Horner (1971) shaped the appropriate use of crutches by a mentally retarded spina bifida child. After the behavior had been shaped to criterion, the child's teacher, speech therapist, and the clinic bus driver were included in the program to facilitate the generalization and maintenance of the behavior in everyday living situations (i.e., access to recess, meals, school, speech therapy, and the bus ride to the clinic were all made contingent upon the child's independent use of crutches).

The mild-to-moderate punishment intensities that can be utilized with humans do not promote the generalization and maintenance of treatment effects. Thus, if punishment procedures are used, treatment must often be conducted in many situations, because such immediately negative contingencies are less generally active in the natural environment than positive ones. Bucher and Lovass (1968), Hamilton and Standahl (1967), and Risely (1968) have pointed out that if a behavior is suppressed in one environment it will not necessarily be suppressed in another; but the use of punishment in new situations will enhance generalization. Maintenance of suppression (Hamilton and Standahl, 1967) is related to the timing, intensity, duration, and schedules of the aversive event. Generally the stronger and more immediate the aversive event, the longer lasting and more general the effects appear to be.

A study by Wahler (1969) indicates that if the maintenance and generalization of a behavioral change is not programmed and monitored it may not occur. The compliance behavior of a child was monitored both at home and at school, but only treated in the home. The monitoring revealed that the program decelerated non-compliance at home but the

effect did not generalize to school until an in-school program was implemented.

To monitor the maintenance and generalization of treatment effects, probe and follow-up procedures are often employed (Wahler, 1969; Schumaker, 1970; and Bailey, 1971). These procedures usually involve the therapist taking samples of treatment effects on the treated behavior in different environments, on untreated but similar behaviors in similar or different environments, or on the treated behavior and/or similar behaviors observed a specified period after treatment has ceased. If the probes indicate maintenance and generalization, a treatment will usually be considered effective; if not, new treatment programs may be necessary.

Bailey (1971) in a study on the treatment of articulation errors in predelinquent boys used both probe and follow-up procedures. The children were trained by peers to articulate specified words properly while probe sessions in the experimental situation were employed to check for generalization to untrained words. One month after treatment was completed a post-check was run on treated and untreated words to check for generalization and maintenance.

In a residential treatment setting, Browning and Stover (1971) sometimes follow a procedure of probing many treated and untreated behaviors through such gross techniques as behavioral coding and random sampling. If the data indicates that a treated target behavior is not generalizing or maintaining, or that a new behavior needs treatment, more precise measurement procedures are implemented.

Alteration of the Natural Environment:

Transfer procedures are viable when the therapist can determine which reinforcers and reinforcement contingencies will control modified behavior in the natural environment. When the therapist can closely replicate the contingencies of the natural environment in the treatment setting, generalization and maintenance of behavioral changes will be enhanced. However, the natural environment's contingencies continually change and new behaviors are required, while old ones become obsolete. This makes the determination of treatment goals a very difficult task. In cases where behavior that is rewarding and self-evaluatively positive must be decelerated, either alteration of natural reinforcement contingencies or the development of self-regulatory functions is necessary to enhance the maintenance and generalization of modified behavioral patterns.

If the natural environment does not adequately reinforce desirable behaviors the behavior brought under stimulus control in an institution or the therapist's office is not likely to maintain and generalize in the natural environment. One way of effectively dealing with this problem insofar as child subjects are involved is to alter the behavior of the control figures in the child's environment, i.e., teachers, parents, and peers.

Several studies report ths successful use of this procedure (Bernal, Duryee, Pruett, & Burns, 1970; Fairweather, 1967; Patterson, 1971; and Browning & Stover, 1971). Patterson (1971) describes a treatment approach which employs the parents as the chief agents in the behavioral change program. First, the therapist takes two weeks of baseline observation of familial interactions. Then, through booklets, modeling, and role playing he familiarizes the parents with general principals of reinforcement, aversive control, inadvertent reinforcement, extinction, and with procedures for observing, recording, and monitoring interpersonal behavior. In the second step of the program the parents operationally define the child behavior they want to modify. They are required to functionally analyze both desired and undesired behaviors (i.e., to observe under what conditions the behaviors occur, the frequency and duration of the behaviors, and the stimuli directly preceding and following the behaviors). When the parents have become accurate behavioral observers and can define the reinforcement contingencies which are maintaining unwanted and desired behavior, they are helped, through modeling and role playing, to alter the reinforcement contingencies that they provide for both deviant and desired response patterns. Finally, they are taught how to analyze data and make program changes accordingly. When the program is completed the parents are able to maintain and generalize their child's behavior in the continually changing natural environment.

This approach has been used successfully both in homes and in classrooms. For instance, Hawkins, Peterson, Schweid and Bijou (1971) successfully employed a disruptive child's mother (who had been given appropriate instructions and cues) to shape appropriate social behaviors in her home. Madsen, Becker and Thomas (1970) reported successfully training teachers to use behavior modification to shape appropriate classroom behaviors. McKenzie, Enger, Knight, Perlman, Schneider and Garvin (1970) investigated the use of consulting teachers versed in behavior modification to help teachers with classroom programming for problem children. The consulting teachers helped the regular teachers operationally define the problem behaviors, measure the behaviors, functionally analyze the behaviors, and design and carry out a treatment program in the child's classroom.

If treatment is carried out in a situation where control over peers can be established, then peer behaviors can be programmed via both group and individual contingencies. Carlson (1968) used both procedures to eliminate tantrums that were maintained by peer reinforcement. When the child tantrumed she was placed in the back of the room so other children would have to turn around to look at her. Under the individual contingency the other children were individually rewarded with candy treats if they did not turn around during a tantrum. A group contingency was implemented as a positive incentive for not tantruming; and to prevent the provoking of tantrums by the other children. The problem child got a gold star on the board for each half day she went without a tantrum, and when gold stars were earned four days in a row there was a class party with the problem child passing out the treats. Patterson (1971)

also discusses similar individual programming of a child's siblings to eliminate the provoking of undesirable behaviors.

Establishment of Self-Regulatory Functions:

It is not always possible to anticipate or simulate the reinforcement contingencies of the natural environment, nor is it often possible to change them. The therapist may be able to shape desirable behaviors in an institution or his office, but he may find it difficult to eliminate the peer group's influence on his client's behavior outside of these controlled situations. The establishment of appropriate self or inner-controls in the client's behavioral repertoire through self-monitoring, self-reinforcement, self-punishment, and contract management is one possible solution.

"Self-monitoring" has been used effectively to teach clients to change their own behavior in the natural environment (Rutner and Bugle, 1969; Broden, Hall and Mitts, 1971). Broden, et. al. (1971) investigated the effects of self-recording on the classroom behavior of two junior high school students. In one experiment the study behavior of an eighth-grade girl was recorded during baseline. Following baseline, a counselor provided slips for the girl to record her studying behavior. This procedure resulted in an increase in study behaviors. When the slips were withdrawn study decreased but increased again when the slips were reinstated. After teacher praise for study was increased, self-recording was discontinued without a significant loss in study behavior. In the final phase, increased praise was withdrawn and studying maintained at a high level.

Teaching the client some of the principles of behavior modification has been successfully employed as a strategy to facilitate generalization and maintenance of desirable behaviors (Patterson, 1971; and Blum, 1971). Blum (1971) taught principles of behavior modification to problem students which enabled them to change their own and their peers' inappropriate behaviors. One student who was having a great deal of conflict with another student was taught to operationally define aversive incidents (hitting and swearing) and take baseline counts of their occurrence. At the end of the baseline period he was taught several behavior modification procedures; i.e., ignoring hitting and swearing behaviors and socially reinforcing desirable behaviors. Under this contingency the number of cursing and hitting incidents was significantly reduced. When baseline conditions were reinstated, the frequency of aversive contacts between the boys increased, but not to the original baseline level. This type of procedure is especially potent because it changes both the client's and his peer's behaviors in desirable directions.

Staats (1971) emphasizes that self-control is a function of language's control of overt behavior through covert verbalizations or thought. If specific thoughts are reinforcing or aversive to the client he can be taught to use thought to elicit, reinforce, and suppress

behavior in inappropriate situations. If properly programmed, covert verbalizations may be able to maintain and generalize modified behavior across environmental configurations. (Cautela, 1970; Homme, 1967).

Several studies (Loew, 1967; Lovaas, 1961) demonstrate that programming verbal behavior can control overt behavior. For example, Lovaas (1961) demonstrated that when verbally aggressive responses were reinforced, subjects showed greater increases in motoric aggressive responses than control subjects reinforced for non-aggressive verbalizations. Such results demonstrate that reinforcement effects can generalize from one class of behavior to another. However, other investigators (Lapine and Harmatz, 1970) who have reinforced verbal behavior have found no generalization to motor behaviors. These contradictory results may be explained by the fact that the motor behaviors and the situations under which they occurred or were probed in the Lapine and Harmatz (1970) study were very dissimilar to the reinforced verbal behaviors and the laboratory setting in which the verbal behaviors were reinforced.

Control of overt behavior through thought is the basis of covert sensitization and desensitization therapies (Davis, 1969; Cautela, 1970; and Homme, 1966). Davis (1969) taught an unruly ten-year-old boy to imagine aversive images or words (his father's angry mood) after inappropriate acts or thoughts of inappropriate acts. This procedure carried out in the therapist's office resulted in general and rapid improvement of the boy's behavior. Cautela (1970) had demonstrated the successful use of covert positive reinforcement and covert extinction. For example, to extinguish psychosomatic complaints a teenager in a training school was asked to imagine that he was complaining but no one paid any attention. A male homosexual was taught to reinforce himself for calling girls for dates. First, he learned to imagine a reinforcing image and calling a girl for a date. Next, he was taught to make the reinforcing image contingent upon the date calling image. Finally, he learned to make the covert reinforcer contingent upon actually calling for a date.

Homme (1967) coined the term "coverant" (covert operant) to designate events the layman calls mental (e.g., thinking, imagining, day dreaming, etc.) which operate on the environment. Theorizing that lack of control of coverants underlies many behavior disorders, Homme developed a technology to control coverants based on Premack's Principle that high probability behavior (HPB) reinforces low probability behavior (LPB). "Coverants" are either HPB or LPB. Low probability (LP) coverants are reinforced with high probability (HP) overt behavior; HP coverants are used to reinforce LP coverants, and HP coverants are used to reinforce LP overt behaviors. For example, Homme suggests that in the case of obesity the client should be taught to make a coverant incompatible with eating (e.g., thinking of the aversive consequencies of eating) a behavior of frequent occurrence. This could be accomplished by making HPB (other than eating) contingent upon thinking of the aversive consequences of eating.

The basic components of self-regulation are self-reinforcement, self-extinction, self-punishment, and self-elicitation of behaviors in appropriate environmental settings. Approaches to behavior therapy such as Cautela's and Homme's provide procedures for teaching clients these self-regulation skills.

The social learning area has provided research on the learning of self-regulatory behaviors. For instance, Mischel and Liebert (1966) demonstrated that schedules of self-reinforcement could be directly taught and that the learning of them was affected by the observation of reinforcement schedules of models. Walters, Parke and Crane (1965) found that the consequences applied to a model's deviant behavior and the punishment parameters of duration, strength, and timing were important determinants of resistence to deviation in children. Bandura and Mischel (1965) demonstrated that delay of gratification, which is highly correlated with resistence to deviation, could be taught. These studies indicate that self-control behaviors, e.g., self-reinforcement and resistence to deviation, can be taught. However, the therapist has to provide procedures for teaching these skills within a clinical setting.

Another strategy that has been found effective in enhancing the maintenance and generalization of behavior change is contract management (Sulzer, 1962; Pratt and Tooley, 1964; and Patterson, 1971). In this procedure there is an implicit or explicit agreement between patient and therapist, or any two parties engaged in modifying each other's behaviors. The fulfillment, or lack of fulfillment, of the contract provides a predetermined contingency. The contract makes the behavior of each party contingent upon the behavior of the other while clarifying and providing reinforcement contingencies for behaviors across situations.

Patterson's (1971) contracting work requires involved parties to first operationally specify the behaviors they want to modify, then develop a method for measuring and monitoring the behaviors, and thirdly negotiate a written contract specifying the reinforcement contingencies to be employed in treating each behavior. The parties involved set aside an hour each day to discuss the data, give reinforcers for contract clauses fulfilled, and, if necessary, renegotiate parts of the contract.

The paper did not attempt to differentiate maintenance and generalization procedures in terms of their relative effectiveness with various types of behaviors since insufficient data exists for this type of analysis. In one of the few efficacy studies, Walker and Buckley (1972) investigated the relative effectiveness of peer reprogramming (training peer to maintain appropriate behaviors), equating stimulus conditions, and teacher training. The results indicated peer reprogramming and equating stimulus conditions strategies maintained significantly more appropriate behaviors than no maintenance strategy (control group). Teacher training did not maintain significantly more appropriate behaviors than no maintenance strategy. The teacher training program lacked intensity, which may explain its ineffectiveness.

In conclusion, many of the procedures currently in use were illustrated to provide the practitioner with a variety of techniques from which he may choose a procedure likely to work best with each of his cases. They key to generalization and maintenance of behavior appears to be the development of appropriate self-control and self-regulatory behaviors.

Procedures which facilitate transfer of learning:

A. Assess reinforcement contingencies in the natural environment and bring desirable behaviors under control.

B. Perform the treatment under many different stimulus conditions.

C. Employ measures, such as probes and follow-up studies, to assess the generalization and maintenance effects of a treatment program during and after treatment.

Procedures to alter the natural environment:

A. Perform the treatment in the natural environment training pre- and para-professional staff or parents, teachers, peers, etc., to be the programmers and behavioral modifiers.

Procedures for developing self-regulatory skills:

A. Have the client self-record behaviors.

B. Teach the client to be a behavior modifier and to modify his own and other's behavior in desirable directions.

C. Bring the client's behavior under covert verbal control so that he can self-reinforce and self-direct his own behavior across situations.

D. Use contract management to control behavior across situations.

E. Teach the client self-evaluative and self-reinforcement behaviors.

All of these procedures can be used in combination of mutually exclusively as each particular situation dictates. It is important to note that maintenance and generalization of induced behavioral changes do not automatically occur. They must be systematically programmed and monitored.

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